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ABSTRACT

Cable television can augment educational broadcast services and also provide a level of individualized educational services not possible with either broadcasting or classroom audiovisual aids. The extra channels provided by cable television allow the following extra services for education: 1) broadcast of a multitude of programs, including delayed or repeated broadcasts, selected lectures or classroom pickups, specialized classroom related reference materials; 2) one-way services like medical and/or free course materials; 3) subscriber response, polling, and request services, with the addition of a limited return signal capacity. Although designs for two-way systems exist, no major two-way system has yet been built. Such systems will present problems such as noise and signal intrusion. Tests that are now scheduled for several sites across the country should solve these problems. Then educators, cable operators, government, and foundations will have to determine the cost benefits of using cables for education. It may be that the costs of leasing channels and terminals will be less expensive in the long run than adding classrooms and instructors, projectors, and cassettes. (JK)

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CABLE TELEVISION AND EDUCATION

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An elementary service, such as a cable system, serving as a secondary aid to educational broadcasting, can be a powerful force in providing a higher level of education. What are the roles that these two communication media can play in serving the community, the students; in augmenting the classroom, in extending education?

You are all familiar with the enhancement, or reinforcement provided in education through the use of a variety of classroom audio/visual aids. You are probably much more familiar with the educational reinforcement and the expansion of distribution available through educational broadcast services. Cable television can add to both of these and additionally, provide for a level of individualized educational services not possible with broadcasting, or with classroom audio/visual aids.

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What role CATV can play in the near and far future of our educational system is to be determined by educators and by engineers, and by joint experimentation.

The more than five million U. S. homes now being served by cable receive little or any educational material other than that broadcast by educational TV stations. A few systems, cooperating with local school systems, are carrying classroom or instructional material. A few others are providing an experimental service in continuing education. They are serving as distribution arms, providing a channel where none is available over-the-air. This is a very valuable service and one of the many roles which cable can play.

Cable systems can be built today, on an economical basis, providing 20, 30 or more television channels, plus a multitude of FM radio signals, plus a limited amount of what we might call data services. Newer cable systems are being constructed with return capability, both in video and in data. The greater majority of [illegible], however, will simply meet FCC requirements; 20 channels and a limited return capability.

Consider the cable as an added portion of spectrum which can carry TV signals without interfering with those presently being

broadcast over-the-air. The signals that are broadcast over-the-air and repeated on cable in effect add no new spectrum capability. It is the channels provided for other than over-the-air distribution which provide the valuable enrichment to our communications.

While an educational broadcaster must share his channel on a time basis, distributing programs for different educational levels or purposes on a consecutive basis, augmentation by cable may allow the educator to simultaneously "broadcast" a multitude of educational programs to selected sectors of his audience. There is a prime time for commercial broadcasting! There may be many prime times for educational broadcasting! If so, the goals of the educator and the commercial broadcaster are the same -- to reach the largest audience possible. With truly cooperative efforts between cable operators and educators, it may be possible to deliver a multitude of educational programs to the right places, at the right times, simultaneously.

Later this week, at forthcoming sessions, you will hear speakers tell you:

- How cable TV can help schools do a better job in instruction and in internal management.
- How cable TV can be franchised and operated to provide pluralistic services at the community level.

You are aware of many of these possibilities but let me give you some facts about present and future cable systems which may be helpful to you in evaluating how educators can cooperate with cable systems for the greater good of all.

We expect a great deal from cable TV systems. We have been promised a great deal. Dozens of foundation supported and private studies have been completed and published, telling us what we can expect -- in the future!

Many of the reports have overemphasized the services and given little time or concern to the realities of financing, design, and operational problems. Our nation can be wired, if we can find a way to pay for it. Today's 5 million or so cable subscribers do not have all the "blue sky" features about which so much has been written; today's cable systems cannot provide most of these services. Let's look at today's systems, the base from which we have to work.

The "composite" of today's approximately 3,000 cable TV systems is a one-way system, carrying about 11 channels of fair quality signals. One of these channels is locally generated, sharing a weather and announcement system with occasional local programming.

This "composite", and the vast majority of those systems which it represents, cannot expand channel capacity without an expenditure of about $100,000 in plant costs plus the cost of converters in every subscriber location.

This is due to the fact that these systems were constructed with either "split-band" amplifiers, amplifying channels 2 thru 6 and 7 thru 13 in separate amplifying sections, or with single ended amplifiers which will not carry mid-band signals without adding signal destroying "beats." These beats are added to the low and high bands and may also provide a host of distortion products that will appear in the mid-band. These systems were "designed", as was the "broadcast" TV allocation, to throw beat products into the mid-band where, until recently, they couldn't hurt TV pictures carried on the 12 channels we have become accustomed to.

What can be done to add channels? Obviously, the system can be rebuilt, a very expensive process and one undertaken only for strong business reasons -- increasing subscribers, reducing maintenance costs, providing new self-supporting and/or profitable services, or, outside funding to help support new services. Just as the educational broadcaster lives to a budget, so does the private industry cable system operator.

In some systems, upgrading to provide at least mid-band signals, 7 or 9 channels, can be achieved by a complete replacement of the headend package with coherent modulators or processors, shifting the carrier frequencies to exact 6 mHz spacings and locking them to a common oscillator, to minimize the visible beats which occur in a single ended amplifying system. Further, system levels must be kept more constant than for 12 channel operation, so automatic gain control and thermatic compensating amplifiers must also be installed, at a minimum, in the trunk system.

Once a system has made these changes, he has more channel capacity, but his subscribers cannot receive these additional channels on their TV set - unless a converter is installed which will convert the new channels (A thru I) to a VHF channel on his set. Such a unit can be provided at a cost of approximately $30, plus the cost of installation, plus the cost of maintenance.

Many systems <u>are</u> being retrofitted, modified, and improved, to provide additional channel carriage, to increase subscriber interest and saturation, and to provide for newly developing Premium TV services.

With extra channel capacity in the majority of existing systems, what services or modes of operation may be available for education? What services are available to be used on this one-way cable system?

First, added channels would allow "broadcast" of a multitude of programs -- delayed or repeats of ETV over-the-air broadcasts -- selected lectures or classroom pickups, specialized classroom related reference materials, and a host of other schemes of which you are all well aware.

Second, with the provision of special coded converters, descramblers, or "gated" receiving devices, one-way addressed services would be available to special sectors of the community -- medical, for example, and/or fee course materials. One-way addressed services could be greatly expanded by the introduction of recording or frame storage devices, providing for reference or information transfer services.

Third, with a limited return signal capability added to the one-way system, we begin to approach interaction -- subscriber response, polling and request services.

On a classic one-way system, this return signal is not available. Its function can be provided crudely by the telephone, as in the MITRE experiment in Reston, Virginia.

Our company, and others, are now looking into the technology and economics of modifying one-way systems to permit the return carriage of a limited amount of return data -- on the cable proper. If we, and/or others are successful, the industry's existing systems

may be able to approximate the type of operation required by the FCC for new systems, retrofitting to increase capacity to at least 20 channels, and having a capacity for return communications on at least a non-voice basis.

Now let's look at the new systems, being built or planned. They will have this capability, but they will also have a number of technical and economic problems as well.

First, the technical problems --

Designs exist today, as does a limited amount of equipment, to build 2-way systems. No major 2-way system has yet been built! A number of systems are in construction, and a number of experiments have been started, or are planned to start soon. A host of unknowns are to be studied, we are embarking on a major experiment and we expect some surprises!

In the FCC's recent Report and Order, the FCC recognized the complexity of the problems in creating a 2-way interactive cable system and, while laying down rudimentary technical standards, called for the creation of an industry technical advisory committee to assist the FCC in establishing much needed standards for this new cable communications service.

Nine panels of industry advisors have been established by C-TAC, Cable Technical Advisory Committee, to study:

Picture quality

Interconnection

Measurement techniques

Operational procedures

Local originated signals

Frequency allocations

Receiving devices

Bi-directional transmission

as well as total system operation.

I chair the panel on bi-directional transmission, Panel 9, and we are hoping to find out, first, what problems we will have with the reversing of the classic branched tree cable distribution system. Just consider that we now originate a signal at one point, the headend, and send it down a branching network to thousands of subscribers. In the reverse direction, we will be sending signals from thousands of points, the subscribers, to one point, the headend. We will have thousands of noise generators on line at the same time, the terminals (and this has not yet been tried) and we will have signals, or noise! What signal-to-noise ratios are possible? What ratio is needed for a practical system?

We will also look into signal intrusion. The spectrum contemplated for return signal transmission is filled, in the air, with communication traffic. Most cable system designs never contemplated trying to shield (keep in, or keep out) signals in this band, never intended for use on the cable. We will also look into the effect of return signals on downstream signals,

and vice versa. It is a major undertaking. The other eight panels have equally heavy loads, with equally important tasks.

While the vital work is underway by the industry and the FCC, thru C-TAC, a number of cable system operators are now building new systems, in compliance with FCC regulations, and a few are experimenting with 2-way services, on a limited basis.

I'm sure you are all familiar with the limited tests run in Overland Park, Kansas, using 2-way audio and video between a school and homebound students. The Mitre tests in Reston are also of interest to the educational community. (I am not mentioning one-way tests, such as those in Oregon and others, for they have been well reported, and may be expanded, duplicated, and further investigated at any time on older existing systems.)

The 2-way tests now planned for Akron, Ohio; El Segundo, California; Orlando, Florida; Jefferson City, Missouri; and Irvine, Texas; will be a start, a very important start in finding out what we can do technically and, economically. The findings of these tests, and, I hope, others, plus the findings of C-TAC will allow us to build and operate the sophisticated communications system we have been hearing about and talking about for so long.

I won't bore you with a recitation of all the wonderful things these new systems can do, for social benefit. Let it suffice that we all agree the potential is there, if handled properly.

But, how will such a system come to pass, as a reality, and how will it serve the educational needs of our country?

The social scientists and the educators have to look realistically at what those systems can do, and at what cost. Analyze the cost benefits and the social benefits, in a manner not unlike the analysis that goes into creating a new university, a new teaching system, or building a new educational TV station.

I feel, considering the extremely large capital investment required by the cable system, that joint efforts by cable operators and educators, including foundations and government agencies, must be initiated and carried forward rapidly to insure that this great potential is properly utilized.

Not only must the services be analyzed in depth but the cost of physical plant and operation must also be carefully covered, for the economics of Cable TV today will not provide the funds to pay for these services. A portion of the system is there, anyway, some might argue. The most important part, to educators, expanded channels, and interaction, is not there, and won't be, unless it is economical. I suggest that the educational community will find that the cost of leasing channels and terminals to achieve their goals will be far less in the long run than the cost of adding classrooms and instructors, projectors and cassettes, etc., even if all of these could be obtained.

Our forecasters say that by 1985, not 1984, we can, through cable TV, have an information and education system available to most U. S. homes. Social scientists, educators and engineers have a great opportunity to work together to develop this major step forward in education and communications. Let us do so more effectively, comparing goals and possibilities, costs and benefits, improving education and its delivery in urban and rural America